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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Electrical connectors for sheets of glass having electrically conductive strips on one surface thereof

- We, COMPAGNIE DE SAINT-GOBAIN, a Body Corporate organised under the laws of the French Republic, of 62 Boulevard Victor Hugo, Neuilly-sur-Seine, France, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 The invention relates to an electrical connector for glass windows provided with electrically conductive resistance strips.
- 15 Glass windows provided with electrically conductive strips whereby they may be heated may be used, for example, in motor vehicles. This enables misting or frosting of the glass and hence impairing of visibility, to be avoided.
- 20 An electrical connector for windows of this type consists of a flat piece of metal provided with means for picking up an electric current, sealed to one face of a glass sheet.
- 25 It has been found that such electrical connectors are rather sensitive to the effect of temperature changes. Because of the difference between the linear coefficient of thermal expansion of the glass and that of the metals used for the electrical connector, severe tensile stresses are set up parallel to the face of the glass when the temperature changes. When the value of these stresses exceeds the strength of the join or the mechanical strength of the glass, the seals fixing the electrical connectors to the glass break. Frequently, cracks form in the surface layer of the glass, and the sheet of glass then becomes unusable.
- 35 This occurs with heated windows, which are subjected to sharp changes of temperature, especially in winter.
- 40 Known electrical connectors are affected by external mechanical stresses on the current pick-up, which are often inevitable when the current pick-up tag is being fitted or removed. Since the pick-up tag generally projects from the main body of the connector, it is readily exposed to the effect of sharp knocks.
- 45 It is an object of the present invention to provide an electrical connector for heated windows which does not suffer from these drawbacks.
- 50 It is therefore, a further object of the present invention to overcome these drawbacks by avoiding a rigid connection at the current pick-up.
- 55 The invention provides an electrical connector in combination with a sheet of glass having sealed to a surface of the sheet a plurality of electrically conductive strips and at least one common collector strip, comprising a strip of metal provided with a current pick-up and joined to the collector strip at two spaced apart portions only, the interconnecting portion between the spaced apart portions being resilient.
- 60 In the present invention the current pick-up is joined to those portions of the electrical connector which are fixed to a common collector strip sealed to the glass, preferably by a resilient interconnecting member of such a shape and of such dimensions that it can undergo a change of shape when the seal or the glass is subjected to excessive stress.
- 65 An electrical connector according to the invention may comprise a single elongated strip or for example may be shaped such as E-shaped. Thus, the two outer ends of the single strip or the two outer arms for example of the E are fixed to a conductor strip sealed to the face of the glass. The current is then picked up by the non-fixed portion, that is, the middle portion or the end of the middle arm of a connector having the shape of an E.
- 70 A suitable electrical connector may be made from a sheet of copper or brass about 0.5 mm. thick and is sufficiently resilient to absorb mechanical stress.
- 75 Further resilience and resistance to the effects of temperature changes may be provided.
- 80
- 85

ed by bowing the non-fixed part of the connector away from the conductor strip.

Alternatively the current supply lead can be run along an edge of the window, and the connection thus being completely concealed by a frame, mounting or sealing strip in which the window is contained. In this case the connector may be made so that its width is slightly less than the glass thickness and may be placed along one edge of the glass sheet, but would be fixed to the collector strip by two tabs at the ends of the connector and at right angles thereto.

The connector may have more than one pick-up arm, which may be so positioned that a supply lead can be brought in from either side of the window. In the latter case, only a single type of connector is needed.

The collector strip may be sealed to the face of the glass in any conventional manner that provides a sound, durable fixing, such as by using a glass-to-metal seal. Also soldering or metallising before hand by conventional methods, have proved particularly suitable. For metallising, a commercially available silver paste, applied hot, has been found effective.

For a better understanding of the invention some specific embodiments will now be described, by way of example only, with reference to the accompanying drawings in which:—

Fig. 1 is a perspective view of part of a window to be heated showing one form of connector according to the invention;

Fig. 2 is a plan view of the window shown in Fig. 1 with the connector removed but showing the areas over which the connector is fixed to a collector strip;

Fig. 3 is a perspective view of part of a window to be heated showing an alternative form of connector;

Fig. 4 is a perspective view showing yet another form of connector; and

Fig. 5 is a perspective view showing still a further form of connector.

In the preferred embodiments to be described the connector is used with a window of a motor vehicle, consisting of a sheet of toughened glass, to one surface of which narrow resistance strips of electrically conductive material have been sealed under heat and are each connected to common collector strips similarly sealed along two opposite edges of the glass sheet.

In Fig. 1 there is shown a sheet 1 of toughened glass, for example, to one surface of which have been sealed narrow resistance strips 2, a few centimetres apart, these resistance strips 2 being connected to a collector strip 3 sealed along one edge of the glass sheet 1. A connector 4 according to the invention is shown soldered to the collector strip.

The connector 4 is E-shaped and has two outer arms 5 and 6 the length of each of which is slightly less than the width of the collector

strip 3. It is preferred that when the connector is fixed in position on the collector strip there should be a minimum distance A of 0.5 mm. to 1 mm. between both ends of each outer arm and the edges of the collector strip. The middle arm 7 of the E-shaped connector 4 is longer than the two outer arms and its outer end 8 is bent back over the main portion through at least 90° to form the current pick-up.

The connector 4 is fixed to the collector strip, by soldering only by its outer arms 5 and 6, and this is shown more clearly in Fig. 2 where the shaded areas 11 and 12 represent the areas of the soldered joints. To prevent a soldered joint from forming in the area lying between the areas 11 and 12, a suitable coating may be applied to that part of the connector or of the collector strip, the coating being of such a nature as to prevent solder from "taking" in that area. Alternatively that portion of the collector strip 3 may simply be shielded during soldering.

It has been found that with the connector joined in this manner when excessive mechanical stresses arise the forces are better distributed and consequently the joints hold better than those previously used.

In Fig. 3 there is shown a modified construction of connector of that shown in Fig. 1. The connector is again E-shaped having two outer arms 5, 6 by which it is fixed to a collector strip 3, and a central arm shown in Fig. 1 the outer end of which is bent back to form the pick-up, but in this modification the long side 13 of the E is bowed outwardly from the collector strip by being bent at 14 and 15. The space formed by the bow may amount to about 1 mm. By forming the bow in the long side 13 the connector is given greater resilience and is better able to take up strain. It also provides a simple but sure means of preventing the long side from being soldered to the collector strip.

Fig. 4 shows yet another construction of the connector. It is again E-shaped and has the long side bowed as in the embodiment shown in Fig. 3, but whereas in that embodiment the arms of the E faced inwardly away from the edge of the glass sheet in the present construction they face towards the edge. The central arm of the E is formed parallel to the glass surface, bent downwardly with a short piece parallel to the edge of the glass sheet and finally has a long pick-up arm 16 transverse to the short piece and running parallel to the edge 17 of the glass sheet. The edge of the glass sheet may be provided with a recess to accommodate the pick-up arm 16, if desired, and so completely hidden in a rubber sealing strip which may be used to contain the edge of the sheet.

It is not always desirable to have a connector with one side bowing outwardly from the glass surface because this may be troublesome

and reduce the effectiveness of the seal when the glass sheet is being fitted in its frame. The connector shown in Fig. 5 overcomes this drawback. The connector comprises a long side 20 and two outer arms 21, 22 transverse to the long side 20. The long side is bowed outwardly and is laid along and parallel to the edge of the glass sheet. The ends of the two arms 21 and 22 are bent down at right angles and soldered to the collector strip 3.

If necessary, this connector can be accommodated in a recess in the edge of the glass.

To avoid the need for using two different types of such connectors, with the current pick-ups facing opposite ways, a special pick-up having two arms 23 and 24, pointing in opposite directions is fixed to the outer face of the long side 20. The lead can then be brought in from either side.

WHAT WE CLAIM IS:—

1. An electrical connector in combination with a sheet of glass having sealed to a surface of the sheet a plurality of electrically conductive strips and at least one common collector strip, comprising a strip of metal provided with a current pick-up and joined to the collector strip at two spaced apart portions only, the interconnecting portion between the spaced apart portions being resilient.

2. An electrical connector combination according to claim 1 wherein said interconnecting portion is resilient and of such shape or dimensions that it undergoes a change of shape when the join or the glass is subjected to excessive stress.

3. An electrical connector combination according to claim 1 or 2 wherein said interconnecting portion is bowed outwardly away from the collector strip.

4. An electrical connector combination according to claim 1, 2 or 3 wherein the strip of metal is rectangular in shape and is joined by its two outer ends only to the collector strip.

5. An electrical connector combination according to claim 1, 2 or 3 wherein the strip of metal comprises a rectangular piece of metal having two arms at the ends thereof and at right angles thereto the strip of metal being

joined by the two outer arms only to the collector strip.

6. An electrical connector combination according to claim 4 or 5 wherein said interconnecting portion also includes the current pick-up, which pick-up is in the form of an elongated arm transverse to said interconnecting portion.

7. An electrical connector combination according to claim 6 wherein the outer end said pick-up arm is bent back through at least 90°.

8. An electrical connector combination according to claim 6 wherein the outer end of the pick-up arm extends from said interconnecting strip over the edge of the glass sheet and is bent in two directions transverse to each other so that said outer end lies along and parallel to said edge of the glass sheet.

9. An electrical connector combination according to claim 5 wherein said two outer arms project inwardly away from the edge of the glass sheet.

10. An electrical connector combination according to claim 5 wherein said two outer arms project away from the outer rectangular piece towards the edge of the glass sheet.

11. An electrical connector combination according to claim 5 wherein the outer ends of the two end arms are bent at right angles to said end arms so that the rectangular piece lies along and parallel to the adjacent edge of the glass sheet.

12. An electrical connector combination according to claim 11 wherein to said rectangular piece is fixed a parallel arm having both its ends free which parallel arm forms two current pick-ups.

13. An electrical connector combination according to any one of the preceding claims substantially as hereinbefore described with reference to the accompanying drawings.

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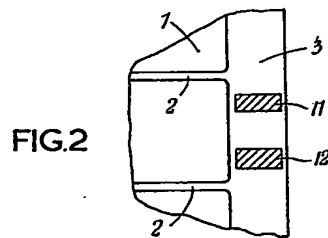
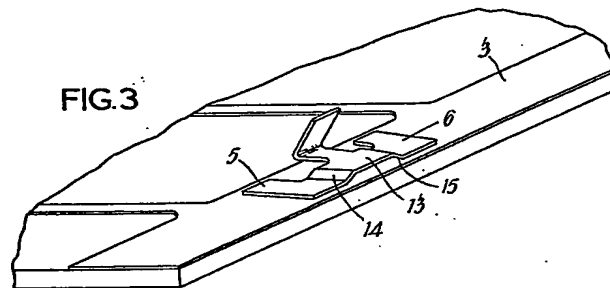
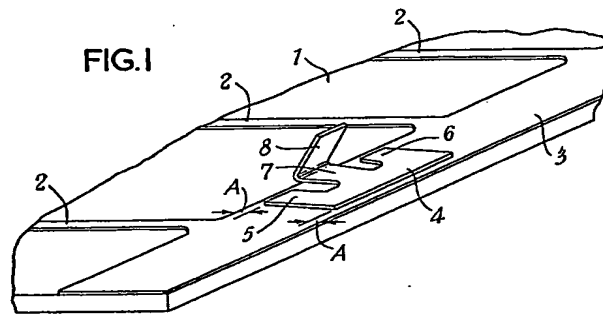
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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale*
Sheet 1



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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
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Sheet 2

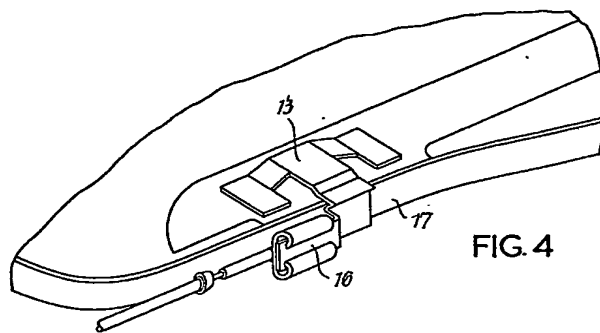


FIG. 4

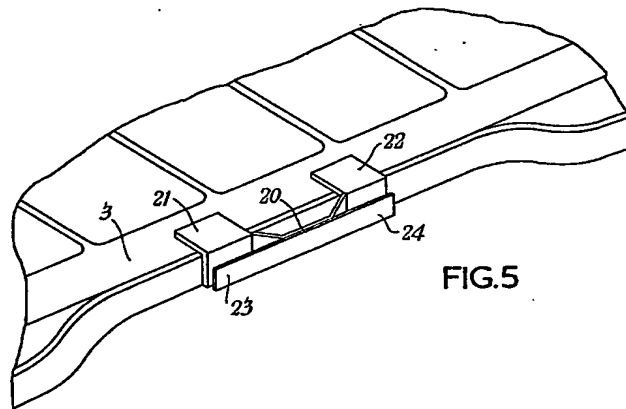


FIG. 5